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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/776,690

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Tao Wu

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EXAMINER

KAO, CHIH CHENG G

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 11/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/776,690

Applicant(s)

WU ET AL.

Examiner

Chih-Cheng Glen Kao

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings were received on September 15, 2006. These drawings are acceptable.

Claim Objections

2. Claims 26-34 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s): (claim 26, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 27, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 28, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 29, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 30, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 31, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 32, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), (claim 33, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program"), and (claim 34, line 1, "A computer program"; inserting - -computer-readable medium encoded with a- - before "computer program").

For purposes of examination, the claims have been treated as such. Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-14 and 25-34 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The claims are directed toward a computer implemented method and medium involving computational data. Though the properties calculated relate to physical properties, the data is none-the-less generated within a computer without a physical manifestation. Thus, these claims do not produce a final result, which meet the standard of being concrete, tangible, and useful.

The claims must be for a practical application of the abstract idea, law of nature, or natural phenomenon. See *Diehr*, 450 U.S. at 187, 209 USPQ at 8 (“application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection”) and *Benson*, 409 U.S. at 71, 175 USPQ at 676 (rejecting formula claim because it “has no substantial practical application”).

To satisfy section 101 requirements, the claim must be for a practical application of the 101 judicial exception, which can be identified in various ways:

1) The claimed invention “transforms” an article of physical object to a different state or thing.

2) The claimed invention otherwise produces a useful, concrete, and tangible result, based on the factors discussed in MPEP 2106. See also:

http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/guidelines101_20051026.pdf.

The manipulation of data by applying an iterative reconstruction algorithm is performed by the computer implementing programs and is therefore nonstatutory subject matter. Manipulation of data does not include a physical transformation outside of a computer or representation thereof. A process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter, is not deemed to be concrete, tangible, and useful, and is therefore non-statutory.

An example which would make the instant claims statutory would be to include a step of displaying the three-dimensional reconstruction of the target element. Hence, the data would become concrete, tangible, and useful.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 5, 15, 18, 25, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Tam (US 5270926).

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5. Regarding claims 1, 15, and 25, Tam discloses a method, system, and computer readable medium encoded with a computer program for imaging, comprising acquiring radiation absorbance images of a target element by moving a radiation source (fig. 12, via #30) through a limited plurality of angles with a source and detector (fig. 12, and abstract, lines 1-3), and applying an iterative reconstruction algorithm (fig. 9, and col. 5, lines 26-28) to generate a three-dimensional reconstruction of the target element (abstract, lines 1-3), wherein the iterative reconstruction algorithm is applied using cone-beam forward projection (fig. 9, #72) and back projection (fig. 9, #64).

6. Regarding claim 2, Tam further discloses wherein the radiation absorbance images are acquired by transmitting x-ray energy from an x-ray source (fig. 12, #22) through the target element (fig. 12, #20) to an x-ray detector (fig. 12, #24).

7. Regarding claims 5, 18, and 28, Tam further discloses wherein radiation absorbance images are acquired through a range of angles that is between about 30 and 120 degrees (fig. 12, #30).

8. Claims 1, 2, 6, 11, 15, 19, 24, 25, 29, and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Cheng et al. (US 5909476).

9. Regarding claims 1, 15, and 25, Cheng et al. discloses a method, system, and computer readable medium encoded with a computer program for imaging, comprising acquiring radiation

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absorbance images of a target element by moving a radiation source (fig. 5, via the trajectory of S(s)) through a limited plurality of angles with a source and detector (fig. 5), and applying an iterative reconstruction algorithm (title) to generate a three-dimensional reconstruction (col. 3, line 35) of the target element (abstract, lines 1-3), wherein the iterative reconstruction algorithm (col. 6, line 27) is applied using cone-beam forward projection (fig. 4, #406) and back projection (fig. 4, #407).

10. Regarding claim 2, Cheng et al. further discloses wherein the radiation absorbance images are acquired by transmitting x-ray energy from an x-ray source (col. 3, lines 25-26) through the target element (fig. 1, #103) to an x-ray detector (fig. 1, #106).

11. Regarding claims 6, 11, 19, 24, 29, and 34, Cheng et al. further discloses wherein the iterative reconstruction algorithm is necessarily a maximum likelihood algorithm implemented using an expectation-maximization algorithm (col. 8, lines 20-37).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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12. Claims 3, 7, 16, 20, 26, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tam as applied to claims 2, 15, and 25 above, and further in view of Malamud (US 6483890).

13. Regarding claims 3, 16, and 26, Tam discloses a method, system, and medium as recited above.

However, Tam fails to disclose wherein an x-ray detector is a digital x-ray detector having a plurality of detector pixels.

Malamud teaches wherein an x-ray detector is a digital x-ray detector (col. 1, lines 15-24) having a plurality of detector pixels (fig. 2, #16).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the method, system, and medium of Tam with the detector of Malamud, since one would have been motivated to make such a modification for more easily processing signals with a computer (col. 1, lines 15-24) as implied from Malamud.

14. Regarding claims 7, 20 and 30, Tam further discloses wherein the three-dimensional reconstruction of the target element would necessarily be represented as an array of voxels having a uniform or non-uniform size in three-dimensions, which are characteristic of 3D CT images (abstract, line 2).

15. Claims 3, 7-10, 16, 20-23, 26, and 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. as applied to claims 2, 15, and 25 above, and further in view of Malamud.

16. Regarding claims 3, 16, and 26, Cheng et al. discloses a method, system, and medium as recited above.

However, Cheng et al. fails to disclose wherein an x-ray detector is a digital x-ray detector having a plurality of detector pixels.

Malamud teaches wherein an x-ray detector is a digital x-ray detector (col. 1, lines 15-24) having a plurality of detector pixels (fig. 2, #16).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the method, system, and medium of Cheng et al. with the detector of Malamud, since one would have been motivated to make such a modification for more easily processing signals with a computer (col. 1, lines 15-24) as implied from Malamud.

17. Regarding claims 7, 20, and 30, Cheng et al. further discloses wherein the three-dimensional reconstruction of the target element is represented as an array of voxels having a uniform or non-uniform size in three-dimensions (fig. 2).

18. Regarding claims 8, 21, and 31, Cheng et al. further discloses wherein a forward projection step is implemented by ray tracing from the x-ray source to a detector pixel and the forward projection of the target element is obtained by necessarily repeating the ray tracing for

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each detector pixel to calculate an attenuation value for each voxel in order to reproject the volume (col. 7, lines 7-10).

19. Regarding claims 9, 10, 22, 23, 32, and 33, Cheng et al. further discloses wherein a back projection step is implemented by necessarily locating detector pixels containing attenuation information relating to a selected voxel and using those pixels to update the attenuation value of the selected voxel, and wherein the back projection step includes performing a back projection for at least each voxel corresponding to a three-dimensional reconstruction of the target element (col. 7, lines 11-21).

20. Claims 4, 14, 17, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tam as applied to claims 1, 15, and 25 above.

21. Regarding claims 4, 17, and 27, Tam discloses a method, system, and medium as recited above. Tam further discloses wherein radiation absorbance images are acquired through a number of angles less than a number (col. 2, lines 56-64).

However, Tam fails to disclose a number of angles less than or equal to about 100.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the method, system, and medium of Tam with the above number of angles, since where the general conditions of a claim are disclosed in the prior art, discovering the working ranges involves only routine skill in the art. One would have been motivated to make such a modification to speed up imaging (col. 1, lines 45-46) as implied from Tam.

22. Regarding claim 14, Tam discloses a method as recited above. Tam further discloses a number of iterations (fig. 9, via #70).

However, Tam fails to disclose a number of iterations less than or equal to about 10.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the method of Tam with the above number of iterations, since where the general conditions of a claim are disclosed in the prior art, discovering the working ranges involves only routine skill in the art. One would have been motivated to make such a modification to speed up processing.

23. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tam as applied to claim 1 above, and further in view of Ning (US 6480565).

Tam discloses a method as recited above.

However, Tam fails to disclose wherein a target element is at least a portion of a human patient, and wherein the target element is a breast of a female patient.

Ning teaches wherein a target element is at least a portion of a human patient, and wherein the target element is a breast of a female patient (title and cover page).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the method of Tam with the breast target of Ning, since one would have been motivated to make such a modification for more accurate detection of breast cancer (col. 3, lines 1-3) as implied from Ning.

Response to Arguments

24. Applicant's arguments filed September 15, 2006, have been fully considered but they are not persuasive.

25. Regarding Tam and Cheng et al. and in response to applicant's arguments, the recitation "tomosynthesis" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone.

26. Regarding Tam and Cheng et al., applicant further argues that these references fail to disclose movement through a limited plurality of angles. The examiner disagrees. Tam and Cheng et al. teach moving through 360 degrees along only one plane. Therefore, movement is through a limited plurality of angles as disclosed in Tam and Cheng et al.

27. Regarding claims 5, 18, and 28, applicant argues that Tam fails to disclose a range of angles between about 30 and 120 degrees. The examiner disagrees. The 360-degree rotation of Tam would necessarily include a range of angles between about 30 and 120 degrees. Therefore, Tam would necessarily read on these claims as recited.

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28. Regarding claims 7, 20, and 30, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "voxel based reconstruction") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

29. Regarding claims 4, 17, and 27, applicant argues that it would not have been obvious to reduce a number of angles or images since resolution would be reduced. The examiner disagrees with this assessment. Although reducing the number of angles or images may reduce resolution, such an obvious modification would also speed up processing, which is desirable. Therefore, it would have been obvious to have a number of angles that is less than or equal to about 100.

In conclusion, applicant's arguments are not persuasive, and the claims remain rejected.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M - F (9 am to 5 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Chih-Cheng Glen Kao
Examiner
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